

U.S.S.N. 10/044,538

Filed: January 10, 2002

AMENDMENT AND RESPONSE AFTER FINAL

In the Claims

1. (currently amended) A polycation compound comprising:
 - a) a natural or synthetic polysaccharide chain having an amount of saccharide ranging from 2 to 2000 saccharide units;
 - b) at least one oligoamine grafted covalently to ~~said~~ the polysaccharide chain per each segment of 5 saccharide units, wherein ~~said~~ the oligoamine is a linear, branched or cyclic alkyl amine having at least two amino groups; and
 - c) at least one further grafted group which is either a hydrophobic group or an amphiphilic group grafted covalently to ~~said~~ the polysaccharide chain per each segment of 50 saccharide units, wherein ~~said~~ the hydrophobic group or amphiphilic group includes an aliphatic chain of at least 4 carbon atoms.
2. (currently amended) A biodegradable polycation complex with a polyanion comprising:
 - a) a natural or synthetic polysaccharide chain having an amount of saccharide ranging from 2 to 2000 saccharide units;
 - b) at least one oligoamine grafted covalently to ~~said~~ the polysaccharide chain per each segment of 5 saccharide units, wherein ~~said~~ the oligoamine is a linear, branched or cyclic alkyl amine having at least two amino groups; and
 - c) at least one further grafted group which is either a hydrophobic group or an amphiphilic group grafted covalently to ~~said~~ the polysaccharide chain per each segment

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of 50 saccharide units, wherein said the hydrophobic or amphiphilic group includes an aliphatic chain of at least 4 carbon atoms; and

wherein the hydrophobic or amphiphilic group is complexed with an anionic macromolecule selected from the group consisting of polynucleic acids, proteins and polysaccharides that are anionic.

3. (currently amended) A biodegradable polycation ~~composition~~ complex according to claim 2, wherein said the anionic macromolecule is selected from the group consisting of a plasmid, an open chain polynucleic acid, an oligonucleotide, an antisense, a peptide, a protein, a polysaccharide and combinations thereof.

4. (previously presented) A biodegradable polycation compound according to claim 1, wherein the polysaccharide chain is selected from the group consisting of dextrans, arabinogalactan, pullulan, cellulose, cellobios, inulin, chitosan, alginates and hyaluronic acid, wherein the polysaccharide chain contains an amount of saccharide ranging from 2 to 2000 saccharide units.

5. (previously presented) A biodegradable polycation compound according to claim 1, wherein the saccharide units in a synthetic polysaccharide are connected by a bond selected from the group consisting of acetal, hemiacetal, ketal, orthoester, amide, ester, carbonate and carbamate bonds.

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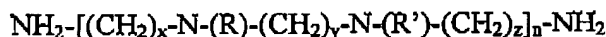
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6. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the polysaccharide is a synthetic polysaccharide formed from the condensation of an aldaric acid and a diaminoalkane.

7. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the grafted oligoamine is grafted to ~~said~~ the polysaccharide chain by a bond selected from the group consisting of an amine bond, an imine bond, an amide bond and a carbamate bond.

8. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the oligoamine has the formula:



wherein x, y, z are ~~an~~ integers between 0 and 4 and $x+y+z$ is between 1 and 4 and n is at least 1 when $x+y+z=2$ or more, or at least 2 when $x+y+z=1$ and wherein R and R' groups are H or an aliphatic group of 1 to 6 carbons.

9. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the oligoamine is a peptide of up to 20 amino acids with at least 50% of the amino acids are cationic including lysine, ornithine, and arginine.

10. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the oligoamine is selected from the group consisting of spermine and alkyl-substituted spermine, wherein the alkyl substituent contains 1-6 carbons.

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11. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the oligoamine is a linear or branched ethyleneimine oligomer having up to 10 ethylene imine units.

12. (currently amended) A biodegradable polycation compound according to claim 1, having an amphiphilic residue wherein ~~said~~ the amphiphilic residue is selected from the group consisting of fatty chains, phospholipids, cholesterol, ethylene glycol oligomers, propylene glycol oligomers and combinations thereof.

13. (currently amended) A biodegradable polycation compound according to claim 12, wherein ~~said~~ the ethylene and propylene glycol oligomers have a fatty chain block on one side.

14. (currently amended) A biodegradable polycation compound according to claim 12, wherein ~~said~~ the amphiphilic residue is connected to ~~said~~ the polysaccharide chain by a bond selected from the group consisting of an amine, amide, imine, ester, ether, urea, carbamate and carbonate bonds.

15. (currently amended) A biodegradable polycation compound according to claim 12, wherein ~~said~~ the amphiphilic residue is an oleic chain.

16. (currently amended) A biodegradable polycation compound according to claim 12, wherein ~~said~~ the amphiphilic residue facilitates the crossing of the polycation through biological membranes.

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17. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the polycation composition is not toxic or immunogenic.

18. (currently amended) A biodegradable polycation compound according to claim 1, wherein ~~said~~ the composition further comprises a ligand for facilitating the binding of ~~said~~ the composition to a cell or tissue.

19. (previously presented) A biodegradable compound according to claim 1, in combination with cationic and nonionic lipids or polymers for enhanced cell transfection.

20. (currently amended) A biodegradable compound according to claim 1, wherein the polycation has a structure selected from the group consisting of a comb-like chain, a branched chain and a cross-linked chain.

21. (currently amended) A pharmaceutical composition, comprising the ~~composition~~ complex of claim 2, in combination with a pharmaceutically acceptable carrier.

22. (original) A pharmaceutical composition of claim 21, in combination with a biodegradable polymer matrix or capsule for controlled, timed and extended delivery of the complex.

23. (currently amended) A porous matrix suitable as a scaffold for cell growth comprising a porous scaffold suitable for attachment of cells, wherein the scaffold is formed of a polycation composition comprising

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a) a polysaccharide chain having an amount of saccharide ranging from 2 to 2000 saccharide units;

b) at least one oligoamine grafted covalently to ~~said~~ the polysaccharide chain per each segment of 5 saccharide units, wherein ~~said~~ the oligoamine is a linear, branched or cyclic alkyl amine having at least two amino groups; and

c) at least one further grafted group which is either a hydrophobic group or an amphiphilic group grafted covalently to ~~said~~ the polysaccharide chain per each segment of 50 saccharide units, wherein ~~said~~ the hydrophobic group or amphiphilic group includes an aliphatic chain of at least 4 carbon atoms.

24. (currently amended) A cationic coating composition applied to a substrate for use in the printing or electronic industries comprising:

a) a polysaccharide chain having an amount of saccharide ranging from 2 to 2000 saccharide units;

b) at least one oligoamine grafted covalently to ~~said~~ the polysaccharide chain per each segment of 5 saccharide units, wherein ~~said~~ the oligoamine is a linear, branched or cyclic alkyl amine having at least two amino groups; and

c) at least one further grafted group which is either a hydrophobic group or an amphiphilic group grafted covalently to ~~said~~ the polysaccharide chain per each segment of 50 saccharide units, wherein ~~said~~ the hydrophobic group or amphiphilic group includes an aliphatic chain of at least 4 carbon atoms.

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25. (currently amended) A biodegradable ~~composition~~ complex according to claim 2, in combination with cationic and nonionic lipids or polymers for enhanced cell transfection.

26. (currently amended) A biodegradable ~~composition~~ complex according to claim 2, wherein the polycation has a structure selected from the group consisting of a comb-like chain, a branched chain and a cross-linked chain.